

AN EVALUATIVE STUDY OF THE  
EFFECTS OF WEIGHT TRAINING ON  
COLLEGE FRESHMEN AT KANSAS STATE UNIVERSITY

by

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## INTRODUCTION

At the present time there is great emphasis being placed on weight training in our colleges and universities. This rapid increase has been caused, in part, by the recent emphasis on physical fitness. As a result of a considerable amount of research in the area of weight training many physical educators have been led to assume that there are physical fitness and motor ability improvements to be derived from the use of weight training in the physical education program. Today many physical education programs are employing weight training to supplement their classes or as a class in itself.

At Kansas State University, Manhattan, Kansas, the physical education department has been offering classes of weight training in the physical education program for the past several years. This investigator had the opportunity to observe these classes and became interested in the effects of the weight training program on the motor ability of the students participating in the program. This interest led to the present study.

### Statement of Problem

The study was designed to deal with an evaluation of the weight training program at Kansas State University, Manhattan, Kansas, (1963) and the effects on motor ability. More particularly, the purpose of this study was to examine the weight training program at Kansas State University and measure the improvement in motor ability upon the students participating in the program. It was also the purpose of this study to determine the efficiency of the weight training program being offered.

### Scope of the Study

Thirty-seven college freshmen at Kansas State University, Manhattan, Kansas, participated as subjects in this investigation. However, the results of only thirty-six were used in the final analysis because one subject had excessive absences. All the subjects were selected on a volunteer basis from two basic physical education classes. They met at their regular class time to participate in the weight training program. Both groups met twice a week for approximately forty minutes per class period. The study was conducted for a period of nine weeks. At the beginning of the program each subject was given the same motor ability test given to all freshmen entering Kansas State University. This test included the zigzag run, standing broad jump, and the medicine ball put. The same test was given at the end of the study to evaluate the effects of the weight training on the motor ability of the subjects who participated.

### Equipment

The equipment used in this study included:

1. Four sets of bar bells. The bar weighed twenty-five pounds and the attachments at each end permitted the addition of one and one-half, five, ten, and twenty pound weights.
2. Two benches, approximately twenty inches high, ten inches wide and six feet in length for use in performance of bench presses.
3. One medicine ball weighing six pounds for use in the medicine ball put.
4. One stop watch for use in timing the zigzag run.

5. One tape measure for measuring distance in the standing broad jump and medicine ball put.

#### Basic Assumptions

1. Subjects gave forth maximum effort during both testing situations and training sessions.
2. Subjects' outside activities did not materially affect the study.

#### Limitations of Study

1. It was impossible to control the outside exercise activities of the subjects.
2. It would be difficult to determine the effects of motivation on each individual's training.

#### REVIEW OF RELATED LITERATURE

In conducting this study this investigator found it necessary to review existing literature in the field of weight training. The following review is presented in an attempt to indicate the effects of weight training on physical fitness.

Gene Hooks, (1963) in his book Application of Weight Training to Athletics, states that the easiest and surest way to attain general physical fitness is with weights. He lists six benefits which can be derived from weight training. These benefits are as follows:

1. Improved strength
2. Enlargement of the exercised muscles
3. Improved power, endurance, flexibility, and speed

4. Improved body measurements

5. Improved confidence and feeling of well being

Hooks concludes that through weight training the muscles function more smoothly and with more power, but with less actual effort.<sup>1</sup>

Many people still may question the previous statements made by Hooks on weight training and its effects on physical fitness. However, contrary to this expression of doubt, there is substantial experimental data related to the area of weight training which supports Hooks' statements. Following is a review of some of the experimental studies that support the point of view that weight training favorably affects physical fitness.

Black (1956) conducted a Study on the Effects of Weight Training on Physical Fitness Index of High School Boys. He selected two groups of fifty boys. One acted as an experimental group and the other as a control group. The experimental group participated in an organized Progressive Resistance Exercise Program, three periods per week, forty minutes per period, for seven months. The control group participated in a regular class program of physical education for the same period of time as that of the experimental group. Physical Fitness Index scores were recorded before and after the investigation. After an analysis of the two scores of both groups, Black concluded that Progressive Weight Training increased the Physical Fitness Index scores of high school boys. The increase was 23.62 per cent in favor of the experimental group.<sup>2</sup>

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<sup>1</sup> Gene Hooks, Application of Weight Training to Athletics, p. 27.

<sup>2</sup> Irving S. Black, The Effects of Weight Training on Physical Fitness Index of High School Boys. This was taken from an unpublished Master's thesis, Boston University, Boston, Massachusetts, 1956.

Fishbain, in an attempt to show the effects of weight training on dynamic strength of adolescent males, set up a program with two groups: one a control group and one an experimental group. Each group consisted of thirty-five subjects. They met three times a week, for approximately forty minutes, for a period of nine weeks. The experimental group worked with eight basic exercises of weight training. The control group continued with the regular physical education activities. Both groups were tested in the thirty-five yard dash and the standing broad jump before and after the study. The results of the final test warrant the conclusion that the experimental group showed significant gains over the control group in both the thirty-five yard dash and the standing broad jump.<sup>3</sup>

Zorbas and Karpovich (1951) carried on an experiment to show the effects of weight training on non-trainers and trainers involving the speed of muscular contraction. Their conclusion supports the idea that speed of a body part is positively affected by weight training.<sup>4</sup>

Results similar to those found by Zorbas and Karpovich have come from studies dealing with the effect of weight training on the speed and movement of the whole body. Hooks, in an experiment, studied the effects of a weight training program on the running speed of twenty-seven male subjects. He set up a six week supervised program of weight training. The subjects were college freshmen selected from basic physical education classes at Wake Forest University. They were given an initial test and a final test for speed in

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<sup>3</sup> Jerome Fishbain, The Effects of a Nine Week Weight Training Program Upon Measures of Dynamic Strength for Adolescent Males. This was taken from an unpublished Master's thesis, University of Wisconsin, Madison, Wisconsin, 1960.

<sup>4</sup> U.S. Zorbas and P.V. Karpovich, "The Effect of Weight Lifting Upon the Speed of Muscular Contractions," Research Quarterly, May, 1951, 22:147-148.

the sixty yard dash before and after the weight training program. The mean score for the first test was 8.58 seconds, and the mean score for the second test was 8.30 seconds, a decrease in time of .28 seconds. These conclusions definitely support the assumption that weight training increases the speed in running tests.<sup>5</sup>

Capen (1952) made a study of college students participating in weight training as opposed to those who participated in regular activities in a physical education program. Capen found that there was a marked increase in the body weight, muscular strength, muscular endurance and athletic power of the students participating in the weight training as compared to those not using weight training.<sup>6</sup>

There is still a great deal of doubt by many physical educators in respect to the effects of weight training upon flexibility and co-ordination. A rather common opinion is that weight training would adversely affect flexibility and co-ordination and interfere with performance. In an investigation of the studies made in this area of weight training and flexibility, Wickstrom (1963) concludes that there is still no definite proof that weight training increases or decreases flexibility; but we do know that performance in motor ability usually is improved as a direct result of weight training.<sup>7</sup>

This survey of related literature has attempted to show the effects of weight training on physical fitness. In the literature review, the author

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<sup>5</sup> Hooks, op. cit., p. 23.

<sup>6</sup> Edward K. Capen, "The Effects of Systematic Weight Training on Power, Strength, and Endurance," Research Quarterly, May, 1952, 23:361-369.

<sup>7</sup> Ralph L. Wickstrom, "Weight Training and Flexibility," Journal of Health, Physical Education and Recreation, February, 1963, 34:61.

feels that significant evidence warrants the conclusion that weight training has a positive effect on physical condition. The author also could not find any evidence that weight training has any detrimental effect upon the person engaging in such an activity.

#### METHODS AND PROCEDURES

##### Description of the Subjects

The subjects chosen for the study were selected from two basic physical education classes at Kansas State University, Manhattan, Kansas. Thirty-five subjects volunteered to participate in the program. One subject participated on recommendations made by his doctor. The only qualification was that each subject be screened by the investigator to insure that they were interested in giving a maximum effort during the testing and training program.

Table 1 shows a description of the age, height, and weight characteristics of the subjects participating in this study.

Table 1. Summary of age, height, and weight of subjects in study group.

Subject Number	Age Months	Height Inches	Weight Pounds
1	224	68.00	132
2	222	70.00	159
3	233	70.00	188
4	215	70.00	172
5	225	71.00	157
6	221	65.75	152
7	223	70.00	169
8	232	70.00	141
9	222	75.00	185
10	229	71.00	172

Table 1 (cont.)

Subject Number	Age Months	Height Inches	Weight Pounds
11	228	74.00	143
12	219	69.00	143
13	228	68.00	159
14	230	67.00	121
15	227	68.00	158
16	231	74.00	168
17	222	67.00	141
18	222	74.00	155
19	222	68.00	158
20	227	68.00	157
21	225	66.00	127
22	229	69.00	151
23	235	71.00	177
24	224	72.00	168
25	232	71.50	163
26	226	74.00	186
27	228	69.00	166
28	222	68.00	142
29	227	70.50	152
30	224	71.00	168
31	234	69.00	133
32	226	70.00	159
33	231	67.00	145
34	226	70.00	167
35	232	71.00	205
36	239	66.00	130
Mean	226.78	70.23	156.44

## Description of the Training Program

The training program started February 4, 1963 and continued until April 6, 1963. Prior to the training period, the author attempted to motivate the subjects by relating the positive results of similar weight training programs. A demonstration of each exercise was given illustrating the proper lifting method. Also, prior to the training program, the subjects were divided into

four groups according to weight and height. The starting weights for each exercise were then suggested by the author for each group. When a subject was able to execute an exercise with a reasonable amount of ease he then progressed to a heavier weight.

The six basic exercises used in the study were the same as those used in the weight training classes at Kansas State University. The primary purpose of these exercises was to improve general physical strength and fitness. A definite schedule was set up for the weight training exercises, and each subject followed the plan without interruption or change. After completing the six basic exercises, which consisted of two sets of ten repetitions, the subjects were given permission to work with various other exercises to improve areas they felt needed special attention. Each training period began with vigorous calisthenic exercises. According to Karpovich (1959), these types of exercises tend to warm-up the muscles and to stimulate circulation and flexibility.<sup>8</sup>

A description of the six exercises which were used follows:

1. Overhead-Press. Subject stands erect with bar at chest rest position. The feet should be comfortably positioned about shoulder-width apart. The bar is pressed (pushed) to an overhead position with both arms completely extended. Lower the bar to the chest rest position and repeat.
2. Stiff-Leg-Dead-Lift. Subject bends over and grasps the bar with arms about shoulder-width apart, using the overhand grip, and lifts it to a thigh rest position. The bar is then lowered to the floor by bending at the hips, keeping the knees fully

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<sup>8</sup> Peter V. Karpovich, Physiology of Muscular Activity, pp. 15-19.

extended. Return to the thigh rest position and repeat.

3. Two-Arm-Curl. Subject stands erect and grasps the bar with an underhand grip, shoulder width apart. With bar then at thigh rest position, flex the arms at the elbow joint until the bar touches the chest. The upper arm is motionless and close to the body. Return the bar from chest rest position and repeat.
4. Bench-Press. Subject assumes a supine position on the bench with head, shoulders, and hips contacting it and the legs straddling it, feet flat on the floor. Use an overhand grip and grasp the bar. Press or push the bar to an overhead position, arms fully extended. Return bar to chest and repeat.
5. Sit-ups. Subject assumes a supine position. The hands grasp weight behind the head. The subject then curls to a sitting position. The head is curled first, then the shoulders, then the back.
6. Squats. Subject assumes a standing position with feet comfortably spread the width of the shoulders. The bar is rested across the shoulders and back of the neck with hands grasping it somewhat greater than shoulder width apart. With back straight and chest high the subject flexes at the knees lowering into a half squat. Return to standing position and repeat.

#### Testing Procedure

The test used in this study was the Barrow Motor Ability Test. It is the same test given to each freshman entering the basic physical education classes at Kansas State University as a measure of motor ability. The test is a three item indoor battery, consisting of the standing broad jump, zigzag

run, and medicine ball put. This investigator tested each subject on all three items prior to the program and at the end of the program.

Table 2 shows the norms for the Barrow Motor Ability Test which were established at the University of Wake Forest, Winston Salem, North Carolina (1954). A total score for the test is arrived at by totaling the scores of each test item in appendix 1, 2, and 3.

Table 2. Norms for Barrow Motor Ability Test.

Classification	Score in Points
Excellent	185-up
Good	163-184
Average	138-162
Poor	116-137
Inferior	115-down

<sup>9</sup> Harold M. Barrow, "Test of Motor Ability for College Men," Research Quarterly, October, 1954, 25:256.

A description of each test item follows:

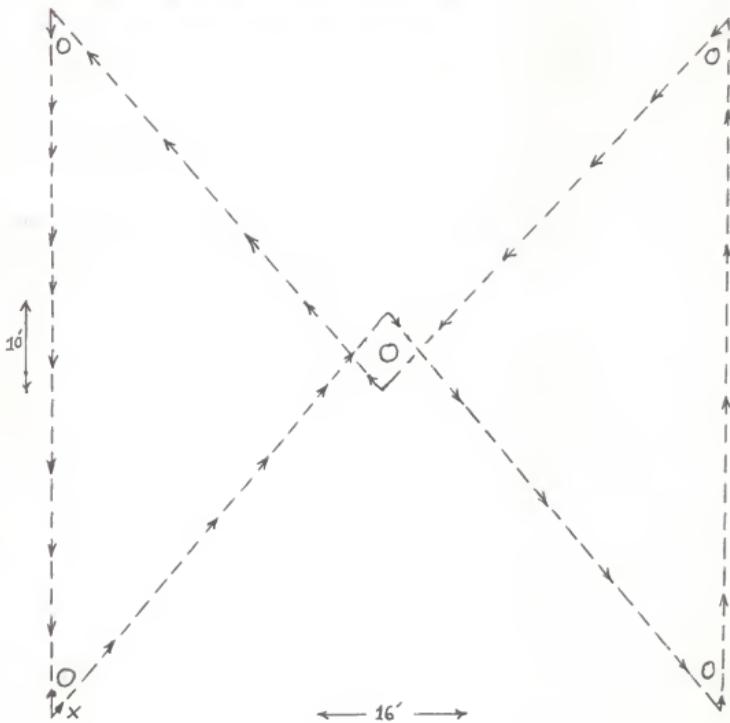
Standing Broad Jump. The subject in the standing broad jump was given a warm-up jump, then three successive trial jumps. The score of the best jump was measured to the nearest inch. The number of inches jumped was then compared to its corresponding score in appendix 1, and the total points are recorded for the test item.

Medicine Ball Put. The subject stands behind a restraining line and is permitted three successive trials in putting a six pound medicine ball. A distance of fifteen feet behind the restraining line is designated as the area in which a run may be made up to the restraining line. Scoring is to the nearest one-half foot, the

best of three trials recorded. This score is then compared with its corresponding score in appendix 2 and the total points are recorded.

ZigZag Run. A course is laid out as depicted in Figure I. The subject starts at point X in a semi-crouched position. He runs the course three times and must not grasp the standards or obstacles placed in the circles. If a foul is committed a second trial is permitted. Scoring is to the nearest tenth of a second. The score is then compared to its corresponding score in appendix 3, and the total points are recorded for the test item.

Fig. I. The course of the zigzag run.



## RESULTS AND DISCUSSION

The findings of this study have presented evidence on the effects of a nine week weight training program upon the motor ability of college freshmen at Kansas State University. Motor ability was tested by measuring performances in the zigzag run, medicine ball put, and standing broad jump.

As may be noted in table 3 all the subjects tested in the three events improved their scores or retained their previous scores.

All but one of the subjects improved in the zigzag run. This was subject number 35. Subject 35 also did not improve in the medicine ball put, and showed only a slight gain in the standing broad jump. With the exception of subject 35, the remaining thirty-five subjects showed a marked increase in their scores for the zigzag run. These results in the initial and final test of the zigzag run showed the least amount of improvement as compared to the medicine ball put and the standing broad jump.

In the medicine ball put, six of the thirty-six subjects remained equal to their previous scores in this event. Five of the thirty subjects who improved showed just a slight increase of one or two points. The initial and final scores of the medicine ball put indicated that a greater number of subjects failed to improve in this event according to the scores in the other two events.

Three subjects in the standing broad jump did not improve their scores over the previous test. However, all three of these subjects exhibited significant gains in points on the final test in the medicine ball put and the zigzag run. These subjects are number 20, 26, and 30.

Table 3. Shows individual score for initial and final test of zigzag run, medicine ball put, and standing broad jump.

Subject Number	ZigZag Run		Medicine Ball Put		Standing Broad Jump	
	Initial Test	Final Test	Initial Test	Final Test	Initial Test	Final Test
	:	:	:	:	:	:
1	53	67	42	53	43	53
2	68	86	64	65	48	56
3	70	75	48	61	33	55
4	57	74	57	57	54	63
5	61	79	57	59	36	43
6	73	83	54	64	59	60
7	71	83	60	61	54	58
8	63	78	51	57	53	56
9	46	54	57	57	43	50
10	38	41	50	51	36	46
11	54	80	51	59	59	68
12	67	77	47	48	49	53
13	83	92	61	61	53	63
14	28	54	25	39	14	26
15	34	59	32	54	29	38
16	65	74	54	56	46	50
17	61	71	44	50	41	44
18	59	81	53	57	51	60
19	59	68	60	62	53	60
20	51	68	53	61	53	53
21	68	78	51	56	28	38
22	72	77	48	53	41	53
23	72	80	70	76	44	53
24	77	89	56	64	59	60
25	63	81	62	67	61	69
26	59	64	59	68	61	61
27	65	86	57	59	60	61
28	61	70	48	51	38	58
29	70	81	51	65	56	60
30	59	61	53	61	43	43
31	66	67	48	48	53	59
32	51	59	53	56	35	41
33	80	90	48	54	50	51
34	48	76	56	68	49	53
35	58	58	65	65	39	41
36	59	54	38	40	41	42

Table 4. Analysis of central tendency and mean gain of the zigzag run, standing broad jump, and medicine ball put.

Event	Initial Test	Final Test	Mean	Mean
	Mean	Mean	Gain	Gain
ZigZag Run	60.80	72.96	12.16	
Standing Broad Jump	46.25	53.33	7.08	
Medicine Ball Put	52.30	57.83	5.53	

For a further analysis of the scores exhibited in table 3, the central tendency of the mass performances for each event is illustrated in table 4. The mean gain for each event is also illustrated.

The mean gains for the group in each event indicated some improvement over the initial test given the subjects.

The mean gain for the zigzag run showed a marked improvement over the medicine ball put and the standing broad jump. Due to this increase in mean gain for the group in the zigzag run over their initial test, the investigator felt that the weight training definitely improved the speed and agility of the subjects.

In the standing broad jump considerable improvement for the group is shown in the mean gain. This improvement is not as great as that for the zigzag run, but it does give evidence that the weights also were a factor in the standing broad jump.

The mean gain for the subjects in the medicine ball put was not as significant as the mean gain for the other two events. The investigator feels this may be due to the fact that the medicine ball put requires more skill than the other two events. Nevertheless, there was a marked improvement.

Table 5 presents the total scores in points for each individual for both the initial test and the final test. The gain in points is also presented to show the range and comparison of all points gained.

The points gained by each individual range from a high of 56 points and a low of 2 points. The subject gaining only 2 points was number 35. In the final testing he failed to improve in the zigzag run and in the medicine ball put.

The subject gaining the highest number of points was scored second to the lowest score in the initial testing. This was subject number 15 who scored a 95 on the first test and a 151 on the final test.

The lowest score on both the initial test and the final test was made by subject number 14. However, this subject had the second highest increase in points which was 52.

The subjects who scored high on the initial test still made gains in points on the final test. Subject 27 illustrates this with a score of 183 on the initial test and 205 on the final test, showing a gain of 22 points. Subject 23, also a high scorer on the initial test, went from a score of 172 to 215, a gain of 43 points.

These gains in points from the initial test to the final test lead the investigator to assume that the weight training program was beneficial to all the subjects regardless of their motor ability before participating in the training program. However, it is reasonable to assume that the weight training had more of an effect on the subjects of lower motor ability at the start of the study.

Table 5. Shows total score for each subject in initial test and final test, and points gained after participating in weight training program.

Subject Number	Initial Test	Final Test	Gain Points
1	138	173	35
2	180	207	27
3	151	191	40
4	168	194	26
5	154	181	27
6	186	207	21
7	185	202	17
8	167	191	24
9	146	161	15
10	124	138	14
11	164	207	43
12	164	177	13
13	197	216	19
14	67	119	52
15	95	151	56
16	165	170	5
17	115	165	20
18	163	198	35
19	172	190	28
20	157	182	25
21	132	172	40
22	166	183	17
23	172	215	43
24	192	213	21
25	186	217	31
26	179	193	14
27	183	205	22
28	117	179	32
29	177	206	29
30	155	164	9
31	167	174	7
32	130	156	26
33	178	195	17
34	179	196	17
35	162	164	2
36	100	137	37

Table 6 makes a final analysis of the training program by showing in points the central tendency of the initial and final test scores of the entire

group and the gain made by the group.

Table 6. Analysis of group central tendency and mean gain in points.

Subject Number	Initial Test		Final Test		Mean Gain
	Mean	Mean	Mean	Mean	
36	157.84		182.83		25.01

The mean gain in points for the group further indicates that the weight training program had positive effects on the motor ability status of the subject who took part in the program.

In carrying the results of this study one step further, the author made a brief comparative study of the results of the subjects' initial and final test scores with the norms of the Barrow Motor Ability Test. This was done to give a clearer indication of the subjects' improvement in motor ability. Table 7 illustrates this comparison.

Table 7. Comparison of initial test and final test to Barrow's norms for Motor Ability Test.

Barrow Norms	Initial Test			Final Test		
	Number Subjects	%	Number Subjects	%		
Excellent 185-up	5	-	13.8	18	-	50.0
Good 163-184	16	-	44.4	12	-	33.3
Average 138-163	9	-	25.0	4	-	11.1
Poor 116-137	3	-	8.4	2	-	5.6
Inferior 115-down	3	-	8.4	0	-	0

From table 7 it can be determined that 58.2 per cent of the students rated good or excellent on the Barrow Motor Ability test before participating in the weight training program. After the weight training program 83.3 per cent of the students rated good or excellent.

## SUMMARY AND CONCLUSIONS

## Summary

The present study was designed: (1) to evaluate the effects of weight training exercises upon the motor ability status of freshmen at Kansas State University, Manhattan, Kansas (1963) and (2) to determine the efficiency of the weight training program being offered.

To achieve these objectives, thirty-six subjects participated in a nine week training program which met twice a week for approximately forty minutes. The program consisted of six basic exercises. The Barrow Motor Ability Test was used to measure the motor ability of each subject at the start and at the finish of the training period. This test consisted of three items: the zig-zag run, standing broad jump, and medicine ball put.

The data consisted of records of performance on individual test items, total scores for the three test items and total scores for the group at the initial test and at the post-test stages. Statistical treatment of the data was made to calculate means for the total score of each test item and the total scores for the group as recorded at both testing periods. A subtraction of the total mean score of the initial test from the total mean score of the final test gave the mean gain for the group. Also treated were the subjects total raw scores of the initial and the post-test for comparison with the norms of the Barrow Motor Ability Test.

### Conclusions

From the data collected by this study it is apparent that all of the participants made marked improvement in their motor ability. The greatest mark of improvement was recorded in the zigzag run. The data also indicated that the weight training program benefited all the subjects regardless of their motor ability before the training program began.

As a final analysis, the author feels it reasonable to conclude that the weight training program at Kansas State University, Manhattan, Kansas, contributes toward the motor ability of the subjects participating in the program. This increase was a mean gain of 25.01 points.

## ACKNOWLEDGMENTS

The author wishes to express his sincere appreciation to Professor T. M. Evans and Assistant Professor R. A. Wauthier, Department of Physical Education, Kansas State University, for their guidance and assistance in the preparation of this study. Further appreciation is extended to the students for their co-operation and willingness to serve as training subjects throughout the length of this experiment.

APPENDIX I  
SCORE TABLE  
STANDING BROAD JUMP

Dist. In.	Score Pts.	Dist. In.	Score Pts.	Dist. In.	Score Pts.	Dist. In.	Score Pts.
11'1"	100	9'3"	75	7'7"	50	5'11"	25
11 0	99	9 2	74	7 6	49	5 10	24
10 11	98	9 1	73	7 5	48	5 9	23
10 10	97		72		47	5 8	22
10 9	96	9 0	71	7 4	46		21
10 8	95	8 11	70	7 3	45	5 7	20
10 7	94	8 10	69	7 2	44	5 6	19
10 6	93	8 9	68	7 1	43	5 5	18
10 5	92		67		42		17
10 4	91	8 8	66	7 0	41	5 4	16
10 3	90	8 7	65	6 11	40	5 3	15
10 2	89	8 6	64	6 10	39	5 2	14
	88	8 5	63	6 9	38	5 1	13
10 1	87		62		37		12
10 0	86	8 4	61	6 8	36	5 0	11
9 11	85	8 3	60	6 7	35	4 11	10
9 10	84	8 2	59	6 6	34	4 10	9
	83	8 1	58	6 5	33	4 9	8
9 9	82		57		32		7
9 8	81	8 0	56	6 4	31	4 8	6
9 7	80	7 11	55	6 3	30	4 7	5
9 6	79	7 10	54	6 2	29	4 6	4
9 5	78	7 9	53	6 1	28	4 5	3
	77		52		27		2
9 4	76	7 8	51	6 0	26	4 4	1

APPENDIX II  
SCORE TABLE  
MEDICINE BALL PUT

Dist.	Score :	Dist.	Score :	Dist.	Score :	Dist.	Score
:	:	:	:	:	:	:	
72	100	56-56.5	75	40	50	24	25
71.5	99	55.5	74	39.5	49	23.5	24
70.5-71	98	55	73	38.5-39	48	22.5-23	23
70	97	54.5	72	38	47	22	22
69.5	96	53.5-54	71	37.5	46	21.5	21
69	95	53	70	37	45	21	20
68-68.5	94	52.5	69	36-36.5	44	20-20.5	19
67.5	93	51.5-52	68	35.5	43	19.5	18
67	92	51	67	35	42	19	17
66.5	91	50.5	66	34.5	41	18.5	16
66.5-66	90	50	65	33.5-34	40	17.5-18	15
65	89	49-49.5	64	33	39	17	14
64.5	88	48.5	63	32.5	38	16.5	13
64	87	48	62	32	37	15.5-16	12
63-63.5	86	47-47.5	61	31-31.5	36	15	11
62.5	85	46.5	60	30.5	35	14.5	10
62	84	46	59	30	34	14	9
61.5	83	45.5	58	29-29.5	33	13.5	8
60.5-61	82	44.5-45	57	28.5	32	12.5-13	7
60	81	44	56	28	31	12	6
59.5	80	43.5	55	27.5	30	11.5	5
59	79	42.5-43	54	26.5-27	29	10.5-11	4
58-58.5	78	42	53	26	28	10	3
57.5	77	41.5	52	25.5	27	9.5	2
57	76	40.5-41	51	24.5-25	26	9	1

## APPENDIX III

## SCORE TABLE

## ZIGZAG RUN

Time	Score	:	Time	Score	:	Time	Score	:	Time	Score
	:			:			:			
17.5	100	:	21.3	75	:	25.1-25.2	50	:	29.0-29.1	25
17.6	99	:	21.4-21.5	74	:	25.3-25.4	49	:	29.2	24
17.7-17.8	98	:	21.6	73	:	25.5	48	:	29.3-29.4	23
17.9	97	:	21.7-21.8	72	:	25.6-25.7	47	:	29.5	22
18.0-18.1	96	:	21.9	71	:	25.8	46	:	29.6-29.7	21
18.2	95	:	22.0-22.1	70	:	25.9-26.0	45	:	29.8-29.9	20
18.3-18.4	94	:	22.2	69	:	26.1	44	:	30.0	19
18.5	93	:	22.3-22.4	68	:	26.2-26.3	43	:	30.1-30.2	18
18.6-18.7	92	:	22.5-22.6	67	:	26.4	42	:	30.3	17
18.8	91	:	22.7	66	:	26.5-26.6	41	:	30.4-30.5	16
18.9-19.0	90	:	22.8-22.9	65	:	26.7	40	:	30.6	15
19.1	89	:	23.0	64	:	26.8-26.9	39	:	30.7-30.8	14
19.2-19.3	88	:	23.1-23.2	63	:	27.0-27.1	38	:	30.9	13
19.4	87	:	23.3	62	:	27.2	37	:	31.0-31.1	12
19.5-19.6	86	:	23.4-23.5	61	:	27.3-27.4	36	:	31.2	11
19.7	85	:	23.6	60	:	27.5	35	:	31.3-31.4	10
19.8-19.9	84	:	23.7-23.8	59	:	27.6-27.7	34	:	31.5	9
20.0-20.1	83	:	23.9	58	:	27.8	33	:	31.6-31.7	8
20.2	82	:	24.0-24.1	57	:	27.9-28.0	32	:	31.8	7
20.3-20.4	81	:	24.2	56	:	28.1	31	:	31.9-32.0	6
20.5	80	:	24.3-24.4	55	:	28.2-28.3	30	:	32.1	5
20.6-20.7	79	:	24.5-24.6	54	:	28.4-28.5	29	:	32.2-32.3	4
20.8-20.9	78	:	24.7	53	:	28.6	28	:	32.4-32.5	3
21.0	77	:	24.8-24.9	52	:	28.7-28.8	27	:	32.6	2
21.1-21.2	76	:	25	51	:	28.9	26	:	32.7-32.8	

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AN EVALUATIVE STUDY OF THE  
EFFECTS OF WEIGHT TRAINING ON  
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by

ALFRED CARL KOUNESKI

B. S., Kansas State University, 1962

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AN ABSTRACT OF A MASTER'S REPORT

submitted in partial fulfillment of the

requirements for the degree

MASTER OF SCIENCE

Department of Physical Education

KANSAS STATE UNIVERSITY  
Manhattan, Kansas

1963

The purpose of this study was (1) to evaluate the effects of the weight training program upon the motor ability of college freshmen at Kansas State University, Manhattan, Kansas, and (2) to determine the efficiency of the weight training program being offered.

In order to accomplish these objectives, a total of thirty-six student volunteers were selected from two basic physical education classes to participate in a nine week weight training program which met twice a week for approximately forty minutes. The weight training program consisted of six basic weight training exercises.

The Barrow Motor Ability Test, which is given to all freshmen entering the Physical Education Program at Kansas State University, was used to measure the motor ability of the subjects prior to the training program and at the conclusion of the training program. The test consisted of three items: the zigzag run, the medicine ball put, and the standing broad jump.

The results of the test centered on the motor ability improvement made by the subjects participating in the weight training program.

As a result of the data collected by this study, it is apparent that all of the subjects participating in the weight training program made improvement upon their motor ability as indicated by their scores on the final test. In all but one case, the subjects improved their initial test scores significantly. There was one subject who did not make a significant gain in the final test. However, this subject did improve his score by one point.

The test item showing the greatest improvement was the zigzag run. This gives reason to conclude that the weight training did improve the subjects' speed and agility.

The data also indicated that the weight training program benefited all of the subjects, regardless of their motor ability at the start of the

training program. However, the data did indicate that the subjects who scored low on the initial test gained more from the weight training program.

From the evidence collected in this study, the writer of this report feels that it is reasonable to conclude that there is an increase in the motor ability of students participating in the weight training classes of the Physical Education Department at Kansas State University, Manhattan, Kansas.